Algebra II **Name:**
Unit 2: Linear Functions **Date:**
Review Packet

1) A friend asks you to explain what a *linear function* is. Give as clear and precise of an explanation as possible

A function is a relationship between inputs and outputs. A LINEAR function is a relationship between inputs and outputs that has a constant rate of change. This creates a straight line.

2) Give as clear and precise of an explanation of what the *rate of change/slope* of a linear function is.

The rate of change of a linear function is a measurement of Δ output over the Δ in input. This is another way of saying: rate of change $= \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{\Delta \text{ output}}{\Delta \text{ input}} =$ slope!

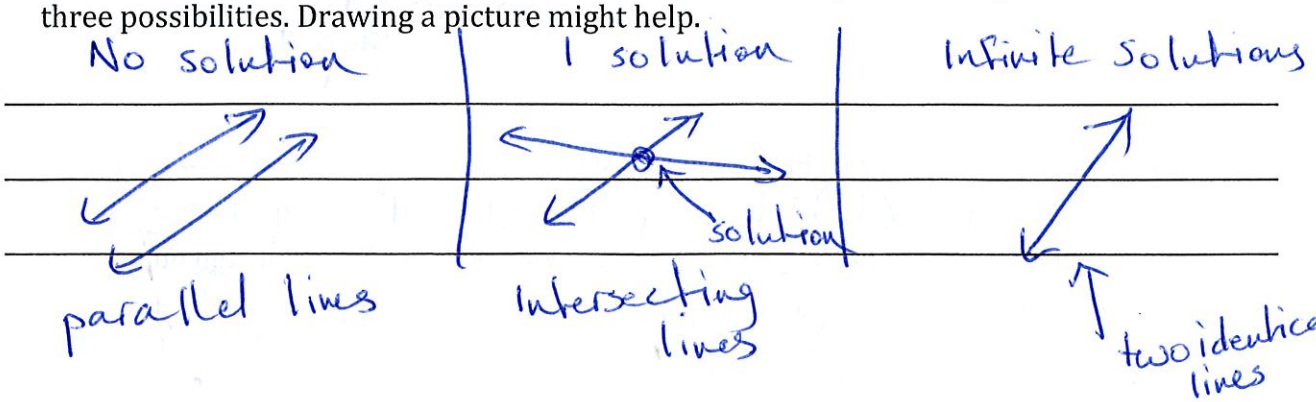
3) Give as clear and precise of an explanation of what a *solution* to a linear question is.

A solution to a linear equation is any coordinate (x, y) that makes the equation true; all the coordinates (x, y) that make the equation true are the points that fall on the line.

4) Give as clear and precise of an explanation of what a *solution* to a system of linear equations is.

A solution to a system of linear equations is the coordinate point (x, y) that makes BOTH equation true and is the point where the two lines intersect.

5) How many solutions could there be to a system of linear equations? Explain each of the three possibilities. Drawing a picture might help.



6) Provide **at least two** definitions/explanations for what each variable represents in the slope-intercept form of a linear equation.

$$y = mx + b$$

output
dependent
total amount

slope
rate of change
rise / run $\frac{\Delta y}{\Delta x}$

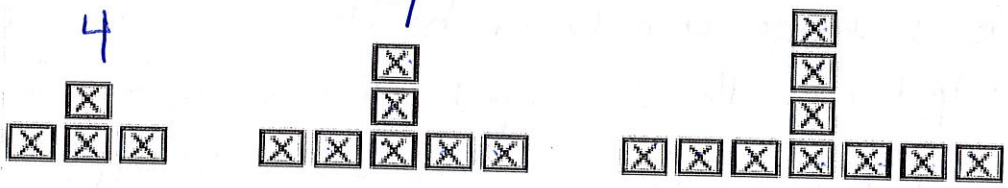
input
independent
step #

starting
amount
y-intercept

7) Use the following pattern to answer the questions below.

(1)

step 0



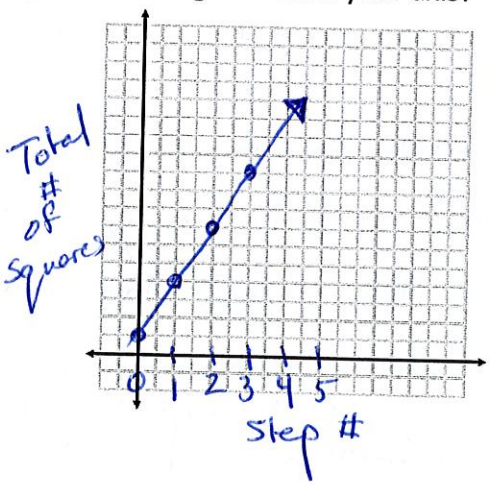
Step 1 **Step 2** **Step 3**

+3 +3

a) Write the **equation** that represents this pattern.

$y = 3x + 1$

b) Summarize the relationship between the number of squares and the step number using a **table/chart** and then with a **graph**. Don't forget to label your axis!



c) How many squares will there be in Step 43?

$y = 3(43) + 1$ $y = 129 + 1 =$ 130 squares

d) If you followed the pattern and drew a step with 304 squares, what step number did you draw?

$304 = 3x + 1$
$-1 \quad -1$
303

$\frac{303}{3} = \frac{3x}{3}$

step 101 $= x$

8) You have $40 in your bank account when you decide to start a tutoring business. After adjusting for the cost of tutoring materials, you figure out that you can make $10 per hour that you tutor.

a. Write an equation in slope-intercept form to represent this situation.

$y = 10x + 40$

b. Describe what the **two variables** and the **two numbers** in your equation represent.

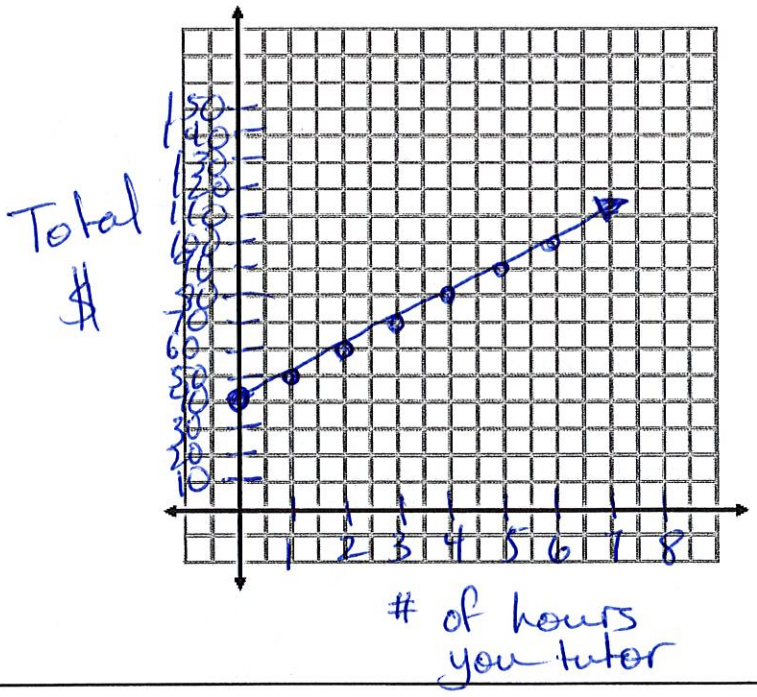
y = total amount of money in your bank account

x = # of hours you tutor

10 = the $ you get per hour

40 = the $ you have in your bank account at the start

c. Graph this situation on the first quadrant of the coordinate plane. Don't forget to label your axis!



c. How much money will you have in your bank account if you tutor for 12 hours?

$y = 10(12) + 40$

$120 + 40 = \$160$

d. How many hours will you have to tutor in order to have $250 in your bank account?

$250 = 10x + 40$

$-40 \quad -40$

$210 = 10x$

21 hours $= x$

9) You're late meeting up with a friend, so you decide to take a taxi. You look at the meter while you're riding and notice that after ~~three~~ going three miles, your fare is $9.75. After ten miles, your fare is $25.50.

+7 +$15.75

a. Write an equation that represents the total cost of your trip as a function of the miles driven.

$y = mx + b$ (3 mi, $9.75) (10, $25.50)

rate of change $= m = \frac{\Delta y}{\Delta x} = \frac{15.75}{7} = \$2.25$ per ~~mile~~

$y = 2.25x + B$

$9.75 = 2.25(3) + B$

$9.75 = 7.75 + B$

$-7.75 \quad -7.75$

$\$2 = B$

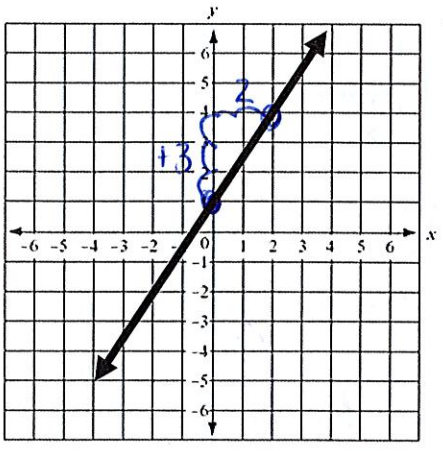
$y = \$2.25x + \$2$

b. How much would it cost to drive 20 miles at this rate?

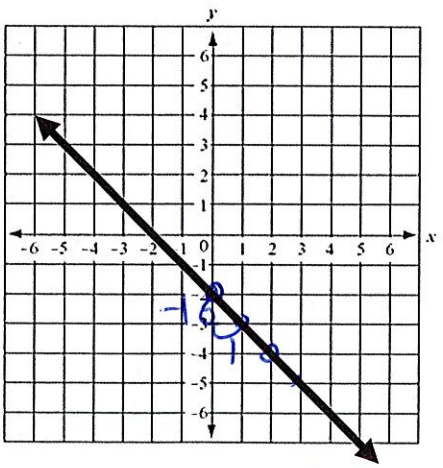
$y = 2.25(20) + 2 =$

$45 + 2 = \$47$

10) Write the equation for the following lines:



Equation: $y = \frac{3}{2}x + 1$

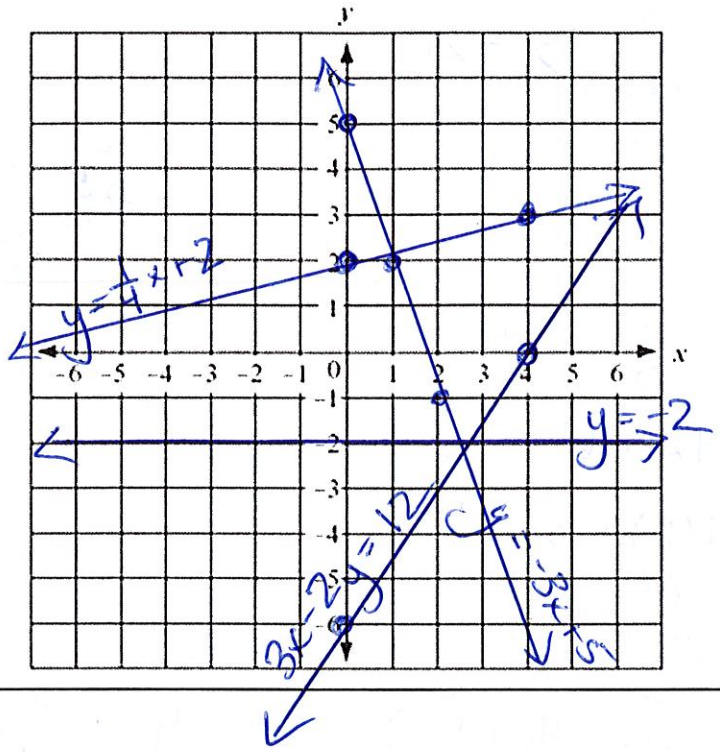


Equation: $y = -x - 2$

11) Graph each line on the coordinate plane. Extend and properly NAME your lines, and use a straight edge.

a. $y = \frac{1}{4}x + 2$ b. $y = -3x + 5$ c. $y = -2$ d. $3x - 2y = 12$

$3x = 12$ $-2y = 12$
$x = 4$ $y = -6$



12) Determine the x and y intercepts for the following linear functions.

$2x - y = 10$	$y = -3x + 6$
$2x - (0) = 10$ $2(0) - y = 10$ $2x = 10$ $0 - y = 10$ $x = 5$ $-y = 10$ $y = -10$	$0 = -3x + 6$ $y = -3(0) + 6$ $-6 \quad -6$ $y = 0 + 6$ $\frac{-6}{-3} = \frac{-3x}{-3}$ $y = 6$ $2 = x$
***x* intercept:** (5 , 0)	***x* intercept:** (2 , 0)
***y* intercept:** (0 , -10)	***y* intercept:** (0 , 6)

13) Write the equation for each of the following representations of linear functions.

x	$f(x)$
-1	5
4	-15
2	-7
-2	9

+5 −20

$m = \frac{\Delta y}{\Delta x} = \frac{-20}{5} = -4$

$y = -4x + B$

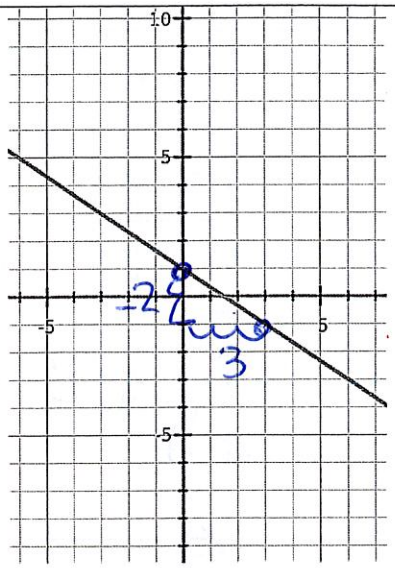
$-7 = -4(2) + B$

$-7 = -8 + B$

$+8 \quad +8$

$1 = B$

Equation: $y = -4x + 1$



Equation: $y = -\frac{2}{3}x + 1$

$(1, 8)\ (5, 20)\ (-1, 2)$

+4 +12

$m = \frac{\Delta y}{\Delta x} = \frac{12}{4} = 3$

$y = 3x + B$

$8 = 3(1) + B$

$8 = 3 + B$

$-3 \quad -3$

$5 = B$

Equation: $y = 3x + 5$

A linear function that has a rate of change of -3 and passes through the point (2, 5).

$y = -3x + B$

$5 = -3(2) + B$

$5 = -6 + B$

$+6 \quad +6$

$11 = B$

Equation: $y = -3x + 11$

14) Solve the following systems using the prescribed method:

Solve using **substitution:**

$$\begin{cases} y = x - 4 \\ 4x - 2y = 10 \end{cases}$$

$4x - 2(x-4) = 10$

$4x - 2x + 8 = 10$

$2x + 8 = 10$

$-8 \quad -8$

$2x = 2$

$x = 1$

$y = x - 4$

$y = 1 - 4$

$y = -3$

$(1, -3)$

Solve using **elimination:**

$$\begin{cases} -2x + 3y = 9 \\ x - 3y = -6 \end{cases} \longrightarrow$$

$-x = 3$

$x = -3$

$(-3, 1)$

$-3 - 3y = -6$

$+3 \quad\quad +3$

$-3y = -3$

$y = 1$

$(-3, 1)$

Solve using **elimination:**

$$\begin{cases} 2x + 3y = -7 \\ 3(6x - y = 9) \end{cases} \longrightarrow \begin{array}{r} 2x + 3y = -7 \\ 18x - 3y = 27 \end{array}$$

$20x = 20$

$x = 1$

$6(1) - y = 9$

$6 - y = 9$

$-6 \quad\quad -6$

$-y = 3$

$y = -3$

$(1, -3)$

15) You stop at an ATM to get some cash. The ATM gives you 14 bills for a total of $85 using only 10 dollar bills and 5 dollar bills.

a. Write a system of equations that models this situation.

f = # of $5
t = # of $10

$f + t = 14$
$5f + 10t = 85$

b. Determine how many $5 bills and how many $10 bills you got.

$(f + t = 14) \cdot -5 \rightarrow -5f - 5t = -70$
$5f + 10t = 85 \rightarrow 5f + 10t = 85$

$5t = 15$
$t = 3$

$f + 3 = 14$
$-3 \quad -3$
$f = 11$

3 tens, 11 fives

16) At a basketball game, you notice that WLPCS's star player scored a total of 36 points by making 15 shots. If the player only made 2-point shots and 3-point shots, how many shots were 2-pointers and how many were 3-pointers?

a. Write a system of equations that models this situation.

t = # of 2 pointers
th = # of three pointers

$t + th = 15$
$2t + 3th = 36$

b. Determine how many 2-point shots and how many 3-point shots the player made.

$(t + th = 15) \cdot -2 \rightarrow -2t - 2th = -30$
$2t + 3th = 36$

$th = 6$

$t + 6 = 15$
$-6 \quad -6$
$t = 9$

9 two-pointers, 6 three pointers

Read the scenario, then answer the questions below.

In 1998, the American Bison population in the United States was struggling. Thanks to conservation efforts, the bison population began to grow at a steady pace of 3,100 bison per year. By 2003 there were 23,005 bison total in the US.

a) Write an equation that represents this scenario.

(m) rate of change

1998 - 2003 = 5 yrs

(5 yrs, 23,005 bison)

x y

$y = mx + b$

$y = 3100x + b$

$23,005 = 3100(5) + b$

$23,005 = 15,500 + b$

$-15,500 \quad -15,500$

$b = 7,505$

$y = 3100x + 7505$

b) How many bison were there in the US in 1998?

starting amount!

7,505 bison

c) Assuming that the bison population continued to grow at the same pace, how many bison are there in the US now?

Now = 2015

1998

− 2015

17 years

$y = 3,100(17) + 7505 =$ 60,205 bison

d) What is the *x* intercept of this scenario? What does it represent?

x intercept = when y = 0

y = total number of bison

x intercept is the number of years from 1998 that would result in there being no bison.

e) What is the *y* intercept of this scenario? What does it represent?

y intercept = starting amount = # of bison in 1998

Read the scenario, then answer the questions below.

In 1997, the wolf population in the United States was struggling. Thanks to conservation efforts, the wolf population began to grow at a steady pace of 1,700 wolves per year. By 2005 there were 17,210 wolves total in the US.

a) How many wolves were there in the US in 1997?

$y = 1,700x + b$

$17,210 = 1700(8) + B$

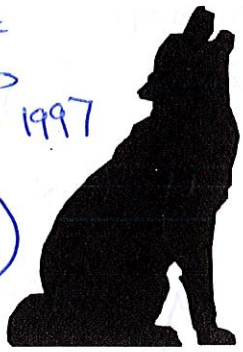
$17,210 = 13,600 + B$

$3,610 = B$

3,610 wolves

2005 = 8 yrs after 1997

(8, 17,210)
yrs total



b) Write an equation that represents this scenario.

$y = 1,700x + 3,610$

c) Assuming that the wolf population continued to grow at the same pace, how many wolves are there in the US now?

Now = 2015 = 18 yrs later

$y = 1,700x + 3,610$

$y = 1,700(18) + 3,610$

$30,600 + 3,610 =$ 34,210 wolves

d) What is the *x* intercept of this scenario? What does it represent?

x intercept is the number of years from 1997 that would make the number of wolves = 0

e) What is the *y* intercept of this scenario? What does it represent?

starting amount: 3,610 wolves